

**DEPARTMENT OF THE ARMY
U.S. Army Corps of Engineers
Washington, DC 20314-1000**

EM 1110-1-4002

CEMP-RT

Manual
No. 1110-1-4002

30 June 1997

**Engineering and Design
GUIDANCE FOR LOW-LEVEL RADIOACTIVE WASTE (LLRW)
AND MIXED WASTE (MW) TREATMENT AND HANDLING**

Table of Contents

Subject	Paragraph	Page	Subject	Paragraph	Page
Chapter 1			Chapter 5		
Introduction			Health and Safety		
Purpose	1-1	1-1	General	5-1	5-1
Applicability	1-2	1-1	Responsibilities	5-2	5-1
References	1-3	1-1	Site Safety and Health Plan	5-3	5-1
Background	1-4	1-1	Designated Personnel	5-4	5-1
Scope	1-5	1-1	Worker Health and Safety	5-5	5-1
Coordination of DoD LLRW Disposal with AMCCOM	1-6	1-2	References	5-6	5-1
Chapter 2			Chapter 6		
Definitions and Effects			Characterization Methods		
Radioactivity	2-1	2-1	Introduction	6-1	6-1
Radioactive Waste Definitions	2-2	2-6	Measurement of Beta Radiation	6-2	6-1
Hazardous Waste Definitions	2-3	2-10	Measurement of Alpha Radiation	6-3	6-2
Mixed Waste Definitions	2-4	2-10	Measurement of Gamma and X-rays	6-4	6-5
Chapter 3			Nonintrusive Drum Imaging Techniques	6-5	6-5
Laws and Regulations Affecting Disposal of Low-Level Radioactive Waste and Mixed Waste			Chapter 7		
Introduction	3-1	3-1	Collection and Handling of Low-Level Radioactive Waste		
Importance and Applicability	3-2	3-1	Introduction	7-1	7-1
Additional Information Sources	3-3	3-1	Drum Handling	7-2	7-1
Chapter 4			Excavation of Contaminated Soils	7-3	7-1
Types and Sources of Wastes			Excavation of Contaminated Sediments	7-4	7-2
Low-Level Radioactive Wastes	4-1	4-1	Removal or Isolation of Contaminated Groundwater	7-5	7-2
Hazardous Wastes	4-2	4-1	Decontamination of Equipment	7-6	7-4
Mixed Wastes	4-3	4-3			
Observed Radionuclide Components in MW	4-4	4-17			

Subject	Paragraph	Page	Subject	Paragraph	Page
Chapter 8					
Treatment of Low-Level Radioactive Waste			Site Selection	11-3	11-3
Introduction	8-1	8-1	Planned Future Disposal Sites	11-4	11-4
Volume Reduction of Solids	8-2	8-1			
Decontamination of Solid Surfaces and Equipment	8-3	8-9	Chapter 12		
Solid-Liquid Separation	8-4	8-17	Treatment and Disposal of Mixed Wastes		
Immobilization	8-5	8-22	General Approaches	12-1	12-1
			Approach to Treatment Technique Selection	12-2	12-2
			Techniques for Treating Hazardous Waste Components	12-3	12-3
Chapter 9					
Final Waste Form Requirements of Low-Level Radioactive Waste			Appendix A		
10 CFR 61 Requirements	9-1	9-1	References		
NRC Requirements	9-2	9-1			
Chapter 10			Appendix B		
Packaging, Transportation, and Labeling of Low-Level Radioactive Waste			Glossary		
Packaging	10-1	10-1			
Transportation and Labeling	10-2	10-3	Appendix C		
			Vendors		
Chapter 11					
Final Disposal of Low-Level Radioactive Waste					
General Considerations for Planning	11-1	11-1			
Commercial Offsite Facilities	11-2	11-1			